

IN THE CLAIMS

1. (*Currently Amended*) An insulated gate bipolar transistor device (IGBT) comprising:
- a substrate heavily doped with a first dopant of one polarity;
 - buffer and drift layers doped with a second dopant of a polarity opposite to the first dopant, the buffer and drift layers located over the substrate, with the drift layer extending to a first surface, said first surface being opposite the substrate;
 - a plurality of base regions at least one base region doped with the first dopant, each at least one base region bordered by the drift layer, and each base region extending along the length of the said first surface to form a plurality of base stripes
 - on the one a corresponding base stripe on said first surface of the device;
 - first and second source stripes doped with the second dopant and located in each base stripe, ~~the source stripes being parallel to each other and extending in the same direction as the base stripes, the source stripes spaced from each other to define a body stripe between the source stripes and spaced from edges of the base stripe to~~
 - ~~define first and second channel regions extending in opposite directions across opposite edges of the base stripes from each of the source stripes to the nearest border of the drift layer~~ said source stripes being spaced apart from and substantially parallel relative to each other, said source stripes extending in a substantially parallel manner relative to the base stripe; a body stripe defined between said source stripes;
 - first and second channel regions, each of said channel regions extending across said base stripe from a corresponding one of said source stripes to said drift

Reply to Office Action of Feb. 10, 2003

layer in a direction away from said body stripe;

a respective gate oxide stripe over ~~the channels on the surface and~~ each
channel region;

25 a respective conductive gate stripe on ~~the~~ each gate oxide stripe for controlling
current through the ~~channels~~ corresponding channel;

cont B2
an a respective insulating layer over ~~the each~~ conductive gate ~~stripes and~~
stripe, each insulating layer entirely covering the edges of the a corresponding one of
the source stripes proximate the body stripe;

30 a source contact layer extending through the insulating layer at a location
between ~~opposite~~ the conductive gate stripes; and

a plurality of source contact regions heavily doped with the second dopant,
disposed in the body stripe and extending from the body stripe to at least one of the
source stripes and in electrical contact with the source contact layer, said source
35 contact regions spaced apart from each other along said body stripe and along said
source stripes.

2. *(Original)* The IGBT of claim 1 wherein one or more source contact
regions extend from the body stripe in opposite directions to each source stripe.

3. *(Withdrawn)* The IGBT of claim 1 wherein the source stripes are
continuous along the length of the body stripe.

4. *(Original)* The IGBT of claim 1 wherein the source stripes are divided into
a plurality of elongated source segments spaced from each other along opposite sides

Reply to Office Action of Feb. 10, 2003

of the body stripe, and portions of the body region extending between opposite ends
of sequential segments to separate the sequential source stripe segments from each
5 other.

5. (*Original*) The IGBT of claim 1 wherein the base stripes are connected
together to form a common base.

6. (*Withdrawn*) The IGBT of claim 4 wherein the source contacts extend
from one source segment across the body stripe to the opposite source segment.

7. (*Withdrawn*) The IGBT of claim 6 wherein the source contacts extend
from the middle of one source segment to the middle of the opposite source segments.

8. (*Original*) The IGBT of claim 4 wherein the source segments are the same
length.

9. (*Withdrawn*) The IGBT of claim 4 wherein source stripes have forward
and rearward ends and the ends of stripes on opposite sides of the body stripe are
directly opposite to each other.

10. (*Original*) The IGBT of claim 4 wherein source stripes have forward and
rearward ends and the ends of stripes on opposite sides of the body stripe are jogged
with respect to each other.

11. (*Cancelled*) The IGBT of claim 4 wherein the source segments are the same length.

12. (*Original*) The IGBT of claim 4 wherein the source segments are of different lengths.

13. (*Currently Amended*) The IGBT of claim ~~11~~ 8 wherein the length of the source segment depends upon its proximity to ~~the~~ a center of the IGBT die.

14. (*Original*) The IGBT of claim 13 wherein the length of the source segment depends upon a desired local SCIS current density.

15. (*Original*) The IGBT of claim 1 wherein the edges of the source stripes adjacent the body stripe are electrically isolated from contact with the source contact layer.

16. (*Original*) The IGBT of claim 1 wherein doping concentration in the source stripes is the same as the doping concentration in the source contact regions.

17. (*Original*) The IGBT of claim 1 wherein doping concentration in the source stripes is the less than the doping concentration in the source contact regions.

Reply to Office Action of Feb. 10, 2003

18. (*Original*) The IGBT of claim 1 wherein the first dopant is p-type and the second dopant is n-type.

19. (*Original*) The IGBT of claim 1 wherein the first dopant is n-type and the second dopant is p-type.

20. (*Currently Amended*) An insulated gate bipolar transistor device (IGBT) comprising:

a substrate heavily doped with a first dopant of one polarity;

5 a drift layer over the substrate and doped with a second dopant of an opposite polarity, the drift layer extending to a surface opposite the substrate;

~~base regions~~ at least one base region doped with the first dopant, each base region bordered by the drift layer and each base region extending along a length of the surface to form a plurality of base stripes on the surface of the device;

10 source stripes with second dopants in the base regions ~~proximate the border of the base regions to form channel regions extending from the source stripes to the proximate border of the drift layer and the base stripe~~ for forming channel regions that extend across said base stripes proximate the surface from a corresponding one of said source stripes to said drift layer in a direction away from said body stripe;

15 ~~an a respective insulated control gate over the base regions, between the source stripe and the drift layer~~ overlying a corresponding base and source stripe and over the channel regions a corresponding channel region, each control gate including a gate stripe and an insulating layer, said insulating layer entirely covering a

Reply to Office Action of Feb. 10, 2003

corresponding one of said source stripes;

20 source contact regions disposed adjacent the source stripes, said source contact
regions spaced apart from each other along said body stripe and along said source
stripes; and

resistances ~~disposed~~ formed within the source stripes between the source
contact regions ~~and the source stripes for~~, said resistances constricting the flow of
electron current between the drift layer and the source contact regions.

21. *(Cancelled)* The IGBT of claim 20 wherein the source contact regions are
spaced from each other along the length of the source stripes to connect opposite
stripes to each other only at spaced apart locations and thereby provide the
resistances.

22. *(Original)* The IGBT of claim 20 wherein the base regions are connected
together to form a common base.

23. *(Original)* The IGBT of claim 20 wherein the source stripes are
sequentially segmented and sequential segments are separated from each other by the
base region.

24. *(Withdrawn)* The IGBT of claim 23 wherein source segments opposite
each other are the same length and are connected at their respective middles by an
source contact region.

25. (*Original*) The IGBT of claim 23 wherein the sequential segments of opposite source stripes are jogged with respect to each other and are connected together at their opposite, jogged ends by an source contact region.

26. (*Original*) The IGBT of claim 20 wherein the first dopant is p-type and the second dopant is n-type.

27. (*Original*) The IGBT of claim 20 wherein the first dopant is n-type and the second dopant is p-type.

28. (*Currently Amended*) An insulated gate bipolar transistor device (IGBT) comprising:

a substrate heavily doped with a first dopant of one polarity;

a drift layer over the substrate and doped with a second dopant of an opposite polarity, the drift layer ~~extending to~~ defining a surface opposite the substrate;

a trench gate in ~~the surface of the drift layer~~ said surface including a gate insulator ~~on the inside surface of~~ disposed between the trench gate and said surface, and a conductive material adjacent the gate insulator forming ~~the~~ a gate electrode;

base regions disposed on opposite sides of said gate trench and being doped with the first dopant, each base region ~~divided by the gate trench~~, bordered by the drift layer and extending along a length of ~~the~~ said surface to form ~~a plurality of~~ base stripes on ~~the~~ said surface of the device;

Reply to Office Action of Feb. 10, 2003

source stripes ~~regions~~ disposed between the base stripes and the trench and shallower than the base for forming channel regions along ~~the outside surface of~~

15 opposite sides of the trench;

source contact regions extending between the base regions and the source stripes,

said source contact regions being spaced apart relative to each other and along the base and source stripes;

a plurality of channel resistances in the source stripes and disposed between the source contact regions;

29. (Original) The IGBT of claim 28 further comprising:

a insulating layer over the trench gate and over source stripe regions;

a plurality of vias in the insulating layer and over the source contact regions;

a source contact layer over the insulating layer and extending through the vias

5 therein to contact the source contact regions in the source stripes.

30. (Original) The IGBT of claim 28 wherein the source contact regions are spaced from each other along the length of the source stripes to connect the source contact layer to the source stripes only at spaced apart locations and thereby provide the channel resistances.

31. (Currently Amended) The IGBT of claim ~~26~~ 28 wherein the base regions are connected together to form a common base.

32. (*Original*) The IGBT of claim 30 wherein the source stripes are sequentially segmented and sequential segments are separated from each other by the base region.

33. (*Withdrawn*) The IGBT of claim 32 wherein source segments opposite each have source contact regions in the middle of the segments.

34. (*Currently Amended*) The IGBT of claim 30 wherein the sequential segments of opposite source stripes are jogged with respect to each other ~~and~~, sequential segments on one side of the trench have source contact regions at ~~the heads~~ of a head end of the segments and sequential segments on the other side of the trench have source contact regions at ~~the tails~~ a tail end of the segments ~~and~~, the ~~heads~~ head ends of the one segments are opposite the ~~tails~~ tail ends of the other segments.

35. (*Currently Amended*) An insulated gate bipolar transistor device (IGBT) comprising:

a substrate heavily doped with a first dopant of one polarity;

a drift layer over the substrate and doped with a second dopant of an opposite polarity, the drift layer extending to a surface opposite the substrate;

base regions doped with the first dopant, each base bordered by the drift layer and extending along a length of the surface to form a plurality of base stripes on the surface of the device;

Reply to Office Action of Feb. 10, 2003

two source stripes regions disposed inside each base stripe, the source stripe
10 regions shallower than the base for forming channel regions at a junction of the base
stripe and the source stripe;

source contact regions extending between the base regions and the source
stripes, said source contact regions being spaced apart along a length of said source
stripes;

15 an insulating layer entirely covering the source stripes and having vias above
the source contact regions;

a source contact layer over the source stripes and in the vias for contacting the
source contact regions.

20 a plurality of channel resistances in the source stripes and disposed between
the source contact regions; and

a gate including a gate insulator and conductive material adjacent the gate
insulator forming the gate electrode, said gate disposed over the channel region
formed by the base and source stripes.

36. (*Cancelled*) The IGBT of claim 35 wherein the source contact regions are
spaced from each other along the length of the source stripes to connect the source
contact layer to the source stripes only at spaced apart locations and thereby provide
the channel resistances.

37. (*Original*) The IGBT of claim 35 wherein the source stripes are
sequentially segmented and sequential segments are separated from each other by the

base region.

38. (*Original*) The IGBT of claim 35 wherein the base regions are connected together to form a common base.

39. (*Withdrawn*) The IGBT of claim 37 wherein source segments opposite each have source contact regions in the middle of the segments.

40. (*Cancelled*) The IGBT of claim 34 wherein the sequential segments of opposite source stripes are jogged with respect to each other and sequential segments on one side of the trench have source contact regions at the heads of the segments and sequential segments on the other side of the trench have source contact regions at the
5 tails of the segments and the heads of the one segments are opposite the tails of the other segments.

41. (*Cancelled*) The IGBT of claim 32 wherein the gate is a planar gate on the surface of the IGBT over the base region.

42. The IGBT of claim 32 wherein the gate is a trench gate extending from the surface into the base region.